

ORIGINAL ARTICLE

Notes on the genus *Brachineura* Rondani (Diptera: Cecidomyiidae), with description of three new species from China

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Abstract The generic diagnosis of *Brachineura* is revised to give an accurate and adequate redescription by adding detailed characters. First records of *Brachineura* in China, including three new species, namely *B. sphaerica* Jiao & Bu, **sp. nov.**, *B. physiphora* Jiao & Bu, **sp. nov.** and *B. prodolichata* Jiao & Bu, **sp. nov.**, are described and illustrated. The type specimens were deposited in the Institute of Entomology, College of Life Sciences, Nankai University, Tianjin, China (NKUM).

Key words Cecidomyiidae, *Brachineura*, new species, new record, China.

1 Introduction

The genus *Brachineura* was erected by Rondani (1840), including *B. fuscogrisea* Rondani from Parma, Italy as the type species. Since 1840, there have been 14 *Brachineura* species reported in Europe by Meigen (1818), Winnertz (1853), Edwards (1937), Kieffer (1904), Rübsaamen (1910) and Mamaev (1967, 1998), 12 species in Russian Far East by Mamaev (1994), Fedotova (2004) and Fedotova & Sidorenko (2006), three species in USA by Felt (1907, 1908) and one in Australia by Skuse (1890). The genus was placed in the tribe Brachineurini by Gagné & Jaschhof (2014), with 30 valid species recorded in the world. So far, *Brachineura* has not been recorded in China. In the present paper, this genus is firstly recorded in China, with three species described as new to science. An updated generic diagnosis and redescription of *Brachineura* with distinguishment from the related genera, and a key to males of all known *Brachineura* species in China are provided.

2 Materials and Methods

Specimens of the three new species were collected by Malaise traps. Adult specimens were preserved in 70% ethanol in the field as soon as collected. For morphological observation, all of the ethanol preserved specimens were dissected into four parts: head, thorax without wings, abdomen and wings, then all the parts were mounted on slides in Canada balsam. The morphological terminology follows Gagné (1981). The holotype and other type specimens were deposited in the Institute of Entomology, College of Life Sciences, Nankai University, Tianjin, China (NKUM).

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All line drawings (Figs 1–11) of the three new species are based on the holotypes (slide numbers: NKUCecid. No. BBM001, BBSS001 & BBC001).

3 Taxonomy

Genus *Brachineura* Rondani, 1840

Brachineura Rondani, 1840: 16; Gagné & Jaschhof, 2014: 126.

Type species: *Brachineura fuscogrisea* Rondani.

Diagnosis. The genus *Brachineura* is characterized in the tribe Brachineurini (Gagné & Jaschhof, 2014; Jiao *et al.*, 2016) by the unique combination of scutum completely covered with scales, vein R_5 bent a little forward in the middle and joining vein C distinctly anterior to wing apex, vein Cu unforked, gonostylus without basal lobes, gonocoxite without distal lobes and having mediobasal lobe reduced to only one to several setae. It is distinguishable from *Rhizomyia* Kieffer, the second largest genus of the tribe Brachineurini, by vein R_5 joining vein C distinctly anterior to wing apex and vein Cu unforked, while the latter genus has R_5 joining vein C at wing apex and Cu forked. And *Brachineura* is also close to *Epimyia* Felt and *Nodalistyla* Fedotova & Sidorenko in Brachineurini by the similar wing vein and mediobasal lobe of gonocoxite, but differs by gonocoxite without distal lobes and gonostylus without basal lobes, while *Epimyia* has gonocoxite inwardly with a stout distal lobe and *Nodalistyla* has gonostylus with basal lobe distinctly protruding outwardly.

Generic redescription. Adult. Palpus with 3 segments, last two segments longer than first one (Fig. 2). Antenna with 10 flagellomeres, each with an extremely shorter neck and only one basal node (Fig. 1) in both sexes. Scutum completely covered with scales. Wing (Fig. 3) hyaline, densely covered with narrow scales and setose except membrane; vein R_1 joining vein C at basal $2/5$; vein R_5 bent a little forward in the middle, joining vein C distinctly anterior to wing apex; vein Cu unforked. Tarsal claw (Fig. 4) usually toothed on all legs, sometimes untoothed. Male seventh and eighth tergites both reduced to one strongly sclerotized and linear band.

Male genitalia. Gonocoxite with mediobasal lobe undeveloped, and reduced to only one to several setae and without distal lobe; gonostylus shaped and arched variously between congeners; cerci separated to form two broad lobes; hypoproct usually deeply emarginated forming two slender lobes; aedeagus sub-cylindrical or sub-conical, usually with modifications.

Female genitalia. Ovipositor short and not protrusible; cerci separated with two short lobes; hypoproct broad, usually forming two lobes; ninth sternite divided longitudinally.

Remarks. Fedotova (2014) gave the latest but simple description of the genus *Brachineura*. In the present paper, the diagnosis is revised to give an accurate and adequate redescription by adding detailed characters for head, thorax and abdomen with the main five diagnostic characters as follows: scutum completely covered with scales, vein R_5 bent a little forward in the middle and joining vein C distinctly anterior to wing apex, vein Cu unforked, gonostylus without basal lobes, gonocoxite without distal lobes and having mediobasal lobe reduced to only one to several setae. With the description of the three new species from China in the present paper, the cosmopolitan genus *Brachineura* includes 33 species now.

Key to males of all known *Brachineura* species in China.

1. Gonostylus with the basal half swollen to be globular; gonostylus approximately as long as the half length of gonocoxite (Figs 5–6) *B. sphaerica* Jiao & Bu, sp. nov.
 Gonostylus with the basal half not swollen distinctly; gonostylus distinctly longer than the half length of gonocoxite (Figs 7, 10)..... 2
2. Aedeagus distinctly longer than gonocoxite, but distinctly shorter than 1.5 times the length of gonocoxite; hypoproct emarginated forming two slender lobes (Figs 7–8)..... *B. physiphora* Jiao & Bu, sp. nov.
 Aedeagus prolonged, approximately two times as long as the length of gonocoxite; hypoproct emarginated forming two triangular lobes in the dorsal view (Figs 10–11)..... *B. prodolichata* Jiao & Bu, sp. nov.

Brachineura sphaerica Jiao & Bu, sp. nov. (Figs 1–6)

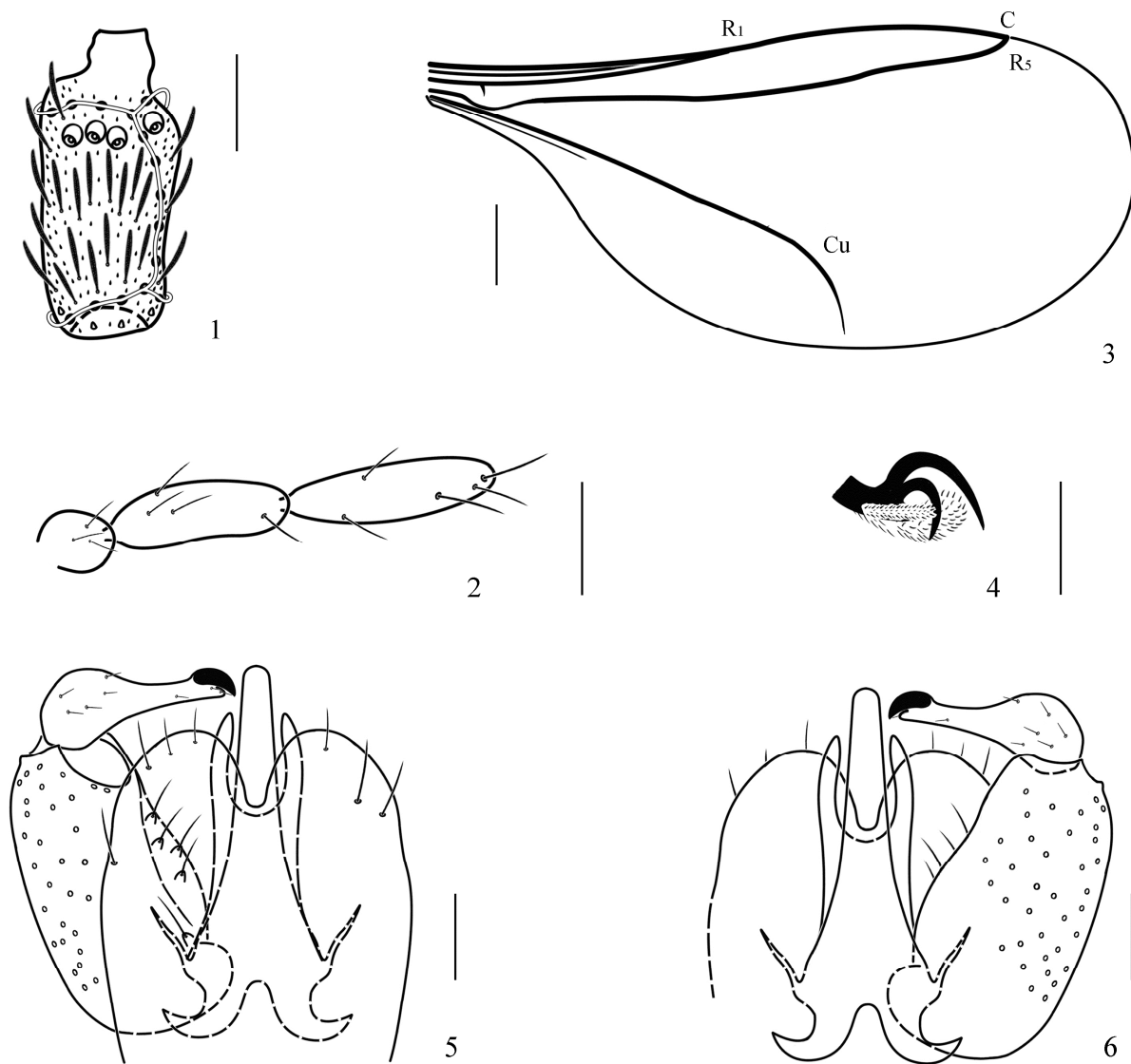
Diagnosis. The new species is characterized in the genus *Brachineura* by the unique combination of gonostylus with the basal half swollen to be sub-globular, and aedeagus with the width of apex distinctly shorter than half the width of the basal half of gonostylus. It is similar to *B. quercina* Edwards by gonostylus with the basal half swollen to be sub-globular (Fig. 5), however, *B. sphaerica* differs by aedeagus with the width of apex distinctly shorter than half the width of the basal half of gonostylus and gonostylus approximately as long as half the length of gonocoxite (Fig. 5), while *B. quercina* having

aedeagus with the width of apex distinctly longer than half the width of the basal half of gonostylus and gonostylus distinctly shorter than half the length of gonocoxite.

Description. Adult. Body colour yellow. Body length 1.00–1.10 mm; wing length (measured from the base) 0.90–1.00 mm; wing width 0.40–0.50 mm ($n=3$).

Head (Figs 1–2). Eye bridge 3 facets long in the middle of vertex. Palpus sparsely setose, with 3 segments, last two segments longer than first one (Fig. 2). Antenna with 10 flagellomeres; pedicel subglobular, smaller than scape, both densely covered with setae ventrally; node of all flagellomeres subcylindrical, a little broadened subbasally, densely covered with long scales, neck of all flagellomeres extremely shorter; each node with 2 horizontal, appressed, band-shaped circumfila, subapically and subbasally respectively linked by two similar longitudinal circumfila, and 2 whorls of long, strong and irregular setae, one subbasal and one subapical; first and second flagellomeres fused; 3rd male flagellomere (Fig. 1), with the node 2.00–2.10 times as long as wide and the neck 0.9–1.0 times as long as wide, 0.23–0.24 times length of node. Head having a finger-shaped structure with dense setae between the two antenna bases.

Thorax (Figs 3–4). Wing (Fig. 3) hyaline, 2.23–2.24 times as long as wide. Vein Sc weak, C, R_1 and R_5 strong; vein R_1 joining vein C at basal 2/5; vein R_5 bent a little forward in the middle, joining vein C distinctly anterior to wing apex, approximately at distal 1/6; vein Cu unforked and bent backward, vein PCu parallel with Cu. Legs densely covered with narrow scales and sparse setae. Tarsal claw (Fig. 4) toothed on all legs; empodium approximately as long as tarsal claw; pulvillus cylindrical.



Figures 1–6. *Brachineura sphaerica* Jiao & Bu, **sp. nov.**, male. 1. The 3rd flagellomere, dorsal view. 2. Palpus, lateral view. 3. Wing, dorsal view. 4. Fore acropod, lateral view. 5. Genitalia, dorsal view, one gonopod removed. 6. Genitalia, ventral view, one gonopod removed. Scale bars: 1–2, 4–6=20 μ m; 3=100 μ m.

Abdomen. Each tergite and sternite densely covered uniformly with scales. First through sixth tergites developed and strip-shaped, with an irregular but mostly single, posterior row of setae, with several pairs of lateral setae, and with one anterior of trichoid sensilla except for the sixth with a double, posterior row of setae; first tergite much shorter than second tergite; seventh and eighth tergites both reduced to one strongly sclerotized, latitudinal and linear band with several scattered setae; second through eighth sternites covered with many scattered lateral and central setae, with one anterior pair of closely set trichoid sensilla; second through sixth sternites sub-rectangular with an irregular but mostly triple, posterior row of setae; seventh sternite shorter than sixth; eighth sternite crescent, much shorter and much narrower than seventh.

Male genitalia (Figs 5–6). Gonocoxite slender, with mediobasal lobes undeveloped and reduced to five separated setae, each inserted in a small, smooth and sclerotized prominence; gonostylus approximately as long as the half length of gonocoxite, with the basal half swollen to be sub-globular and with the distal a little swollen, covered with a few setae and dense microtrichiae, with two short setae located apically on the inner side, toothed apically; cerci separated with a wide depression forming two broad lobes with a few long lateral setae; hypoproct a little longer than cerci, emarginated deeply and widely with a U-shaped depression forming two slender lobes; aedeagus distinctly longer than gonocoxite, gradually tapered from base to middle, with the distal half sub-cylindrical, and with the width of apex distinctly shorter than half the width of the basal half of gonostylus. Female genitalia unknown.

Material examined. Holotype. ♂. China, Heilongjiang, Ning'an, Jingbo Lake, Huluwaizi (43.48°N, 128.55°E; elev. 700 m), 19–20.VII.2001, leg. Jun Li & Yuxia Jiang, Malaise trap, NKUCecid. No. BBM001. Paratypes. 2♂, same data as holotype, NKUCecid. No. BBM002–003.

Distribution. China (Heilongjiang).

Etymology. The specific name *sphaerica* means the male gonostylus with the basal half swollen to be sub-globular.

***Brachineura physiphora* Jiao & Bu, sp. nov.** (Figs 7–9)

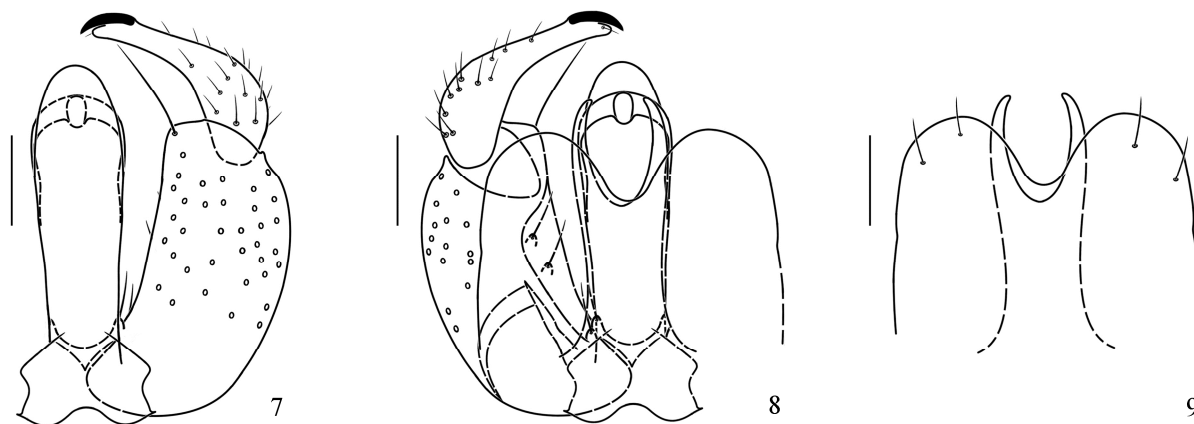
Diagnosis. The new species is characterized in the genus *Brachineura* by the uniqueness of aedeagus ventrally with a blister-like protrusion in the sub-apex and dorsally with a finger-shaped structure. It is similar to *B. fungicola* Mamaev by the elbow-shaped gonostylus (Fig. 8). However, the new species differs by aedeagus ventrally with a blister-like protrusion in the sub-apex and dorsally with a finger-shaped structure in the middle, and gonostylus distinctly longer than half of the length of gonocoxite (Fig. 8), while *B. fungicola* has aedeagus only with a smaller prominence in the apex and gonostylus approximately as long as half the length of gonocoxite.

Description. Adult. Body colour yellow brown. Body length 0.90–1.00 mm; wing length (measured from the base) 0.95–1.05 mm; wing width 0.40–0.50 mm ($n=3$).

Head. Eye bridge 2 facets long in the middle of vertex. Male 3rd flagellomere as *sphaerica* in Fig. 1, with the node 2.30–2.40 times as long as wide and the neck 1.00–1.10 times as long as wide, 0.19–0.20 times length of node. Others as *B. sphaerica*.

Thorax. Wing 2.40–2.50 times as long as wide. Others as *B. sphaerica*.

Abdomen. second through sixth sternites with an irregular but mostly double, posterior row of setae; eighth sternite sub-rectangular. Others as *B. sphaerica*.



Figures 7–9. *Brachineura physiphora* Jiao & Bu, sp. nov., male. 7. Genitalia, ventral view, one gonopod, cerci and hypoproct removed. 8. Genitalia, dorsal view, one gonopod removed. 9. Cerci and hypoproct, dorsal view. Scale bars=20 μm.

Male genitalia (Figs 7–9). Gonocoxite slender, with mediobasal lobes undeveloped and reduced to two separated setae and a pair of closely set setae, each inserted in a small, smooth and sclerotized prominence; gonostylus elbow-shaped, distinctly longer than half length of gonocoxite, covered with a few setae and dense microtrichiae, with a short setae located apically on the inner side, toothed apically; cerci separated with a wide depression forming two broad lobes with a few long lateral setae; hypoproct distinctly longer than cerci, emarginated deeply and widely with a U-shaped depression forming two slender lobes; aedeagus stout and sub-cylindrical, distinctly longer than gonocoxite, but distinctly shorter than 1.5 times the length of gonocoxite, ventrally with a blister-like protrusion in the sub-apex and dorsally with a finger-shaped structure in the middle. Female genitalia unknown.

Material examined. Holotype. ♂. China, Yunnan, Simao (now as Pu'er), Caiyang River Nature Reserve, Luoluoxinzhai Mountain (22.48°N, 100.58°E; elev. 1500 m), 27.V.2000, leg. Wenjun Bu, Malaise trap, NKUCecid. No. BBSS001. Paratypes. 2♂, same data as holotype, NKUCecid. No. BBSS002–003.

Distribution. China (Yunnan).

Etymology. The specific name *physiphora* means the sub-apex of aedeagus ventrally with a blister-like protrusion.

***Brachineura prodolichata* Jiao & Bu, sp. nov.** (Figs 10–11)

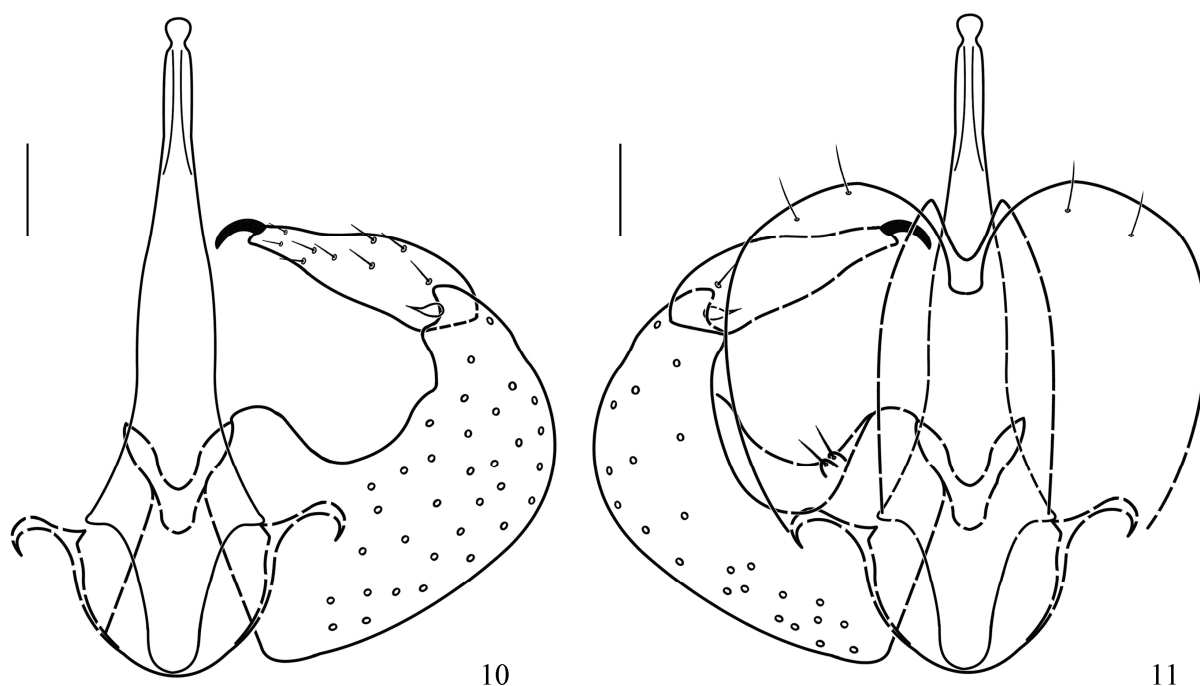
Diagnosis. The new species is characterized in the genus *Brachineura* by the unique combination of gonocoxite sharply arched inwardly at distal 1/4, and aedeagus prolonged, approximately two times as long as the length of gonocoxite. It is similar to *B. flabellata* Fedotova & Sidorenko by gonocoxite sharply arched inwardly at sub-distal (Fig. 11). However, the new species differs by aedeagus prolonged, approximately two times as long as the length of gonocoxite and gonostylus normally shaped, approximately as long as 2/3 the length of gonocoxite (Fig. 11), while *B. flabellata* has aedeagus distinctly shorter than gonocoxite and gonostylus rudimentary, approximately as long as 1/3 the length and width of gonocoxite.

Description. Adult. Body colour yellow. Body length 1.20–1.30 mm ($n=4$); wing length (measured from the base) 1.20–1.30 mm; wing width 0.50–0.60 mm ($n=4$).

Head. Eye bridge 5 facets long in the middle of vertex. 2nd male flagellomere as *sphaerica* in Fig. 1, with the node 2.10–2.20 times as long as wide and the neck 0.60–0.70 times as long as wide, 0.14–0.15 times length of node. Others as *B. sphaerica*.

Thorax. Wing 2.10–2.20 times as long as wide. Others as *B. sphaerica*.

Abdomen. First through sixth tergites with an irregular but mostly single, posterior row of setae; eighth sternite crescent. Others as *B. sphaerica*.



Figures 10–11. *Brachineura prodolichata* Jiao & Bu, sp. nov., male. 10. Genitalia, ventral view, one gonopod, cerci and hypoproct removed. 11. Genitalia, dorsal view, one gonopod removed. Scale bars=20 µm.

Male genitalia (Figs 10–11). Gonocoxite slender, sharply arched inwardly at distal 1/4, with mediobasal lobes undeveloped and reduced to a pair of closely set setae, each inserted in a small, smooth and sclerotized prominence; gonostylus sub-conical, distinctly longer than the half length of gonocoxite, covered with a few setae and dense microtrichiae, toothed apically; cerci separated with a wide depression forming two broad lobes with a few long lateral setae; hypoproct a little shorter than cerci, emarginated widely forming two triangular lobes in the dorsal view; aedeagus sub-conical and prolonged, approximately two times as long as the length of gonocoxite, with the distal 1/3 constricted distinctly and the apex rounded. Female genitalia unknown.

Material examined. Holotype. ♂. China, Guizhou, Daozhen, Dasha River, Fairy Cave (also called as Xiannü Cave, 29.32°N, 107.40°E; elev. 600 m), 24.V.2004, leg. Weibing Zhu, Malaise trap, NKUCecid. No. BBC001. Paratypes. 3♂, same data as holotype, NKUCecid. No. BBC002–004.

Distribution. China (Guizhou).

Etymology. The specific name *prodolichata* means the aedeagus sub-conical and prolonged, approximately two times as long as the length of gonocoxite, with the distal 1/3 constricted distinctly and the apex rounded.

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